WHAT IS CLAIMED IS:

1. An optical functional device comprising:

a first port,

a second port,

a first splitter branching said first port to a first arm and a second arm,

a second splitter branching said second port to said first arm and said second arm,

a first semiconductor optical amplifier disposed on said first arm,

a second semiconductor optical amplifier disposed on said second arm, and

a phase control element disposed between said first semiconductor optical amplifier and said second splitter on said first arm,

wherein constant light is input from either said first port or said second port, and

input signal light is input from either a site between said first splitter and said first semiconductor optical amplifier or another site between said first semiconductor optical amplifier and said phase control element.

2. The optical functional device according to claim 1, said optical functional device being employed as a wavelength converter.

3. An optical functional device comprising:

a first port,

a second port,

a first splitter branching said first port to a first arm and a second arm,

a second splitter branching said second port to said first arm and said second arm,

a first semiconductor optical amplifier disposed on said first arm,

a second semiconductor optical amplifier disposed on said second arm,

a first phase control element disposed between said first semiconductor optical amplifier and said second splitter on said first arm, and

a second phase control element disposed between said second semiconductor optical amplifier and said second splitter on said second arm,

wherein constant light is input from either said first port or said second port, and

input signal light is input from either a site between said first splitter and said first semiconductor optical amplifier or another site between said first semiconductor optical amplifier and said first phase control element.

4. The optical functional device according to claim 3, said optical functional device being employed as a wavelength converter.

5. A fabrication method of an optical functional device comprising:

an optical waveguiding layer production step of forming a clad layer of a first conductivity type, an optical amplifying layer, and a first clad layer of a second conductivity type sequentially on a semiconductor substrate,

a waveguide production step of composition-modifying a part of said clad layers of the first and second conductivity types into a clad layer of a third conductivity type, and a part of said optical amplifying layer into an optical waveguiding layer,

a waveguide ridge production step of forming a waveguide ridge by removing respectively a part of said clad layer of the first conductivity type, said optical amplifying layer, and said first clad layer of the second conductivity type,

an embed growth production step of forming a semiconductor layer of the second conductivity type so as to embed a semiconductor block of the first conductivity type at both sides of said waveguide ridge, and forming a second clad layer of the second conductivity type and a contact layer sequentially above said semiconductor layer of the second conductivity type and said first clad layer of the second conductivity

type,

a surface electrode production step of forming an insulation layer on top of said contact layer, and removing said insulation layer partially to form a contact electrode at a region where said insulation layer was removed, and

a back electrode production step of forming an electrode at a backside of said semiconductor substrate.